SCIENCE & INDUSTRY

ORGANIC GARDENING

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MAY, 1943

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New Health and Prosperity From Soils

Reprinted from "THE CROWN COLONIST"
(From an address to the Singapore Rotary Club, made shortly before the Japanese invasion).

By Dr. J. W. Scharff, B.A., B.Chi.,
(Chief Health Officer, Singapore).

GOOD fertile soil is at the root of the problem of maintaining human and animal health, and the solution to the problem of soil fertility lies in the one word "compost."

My interest in compost and compost-making arose from my contact in London in 1937 with Sir Albert Howard, the originator of the Indore process of composting. The purpose of this process is to convert agricultural wastes and farmyard or animal manure into a fertilizing agency. This is achieved through the rapid breakdown of these materials by means of soil fungi and bacteria. Compost is the key to soil fertility, by which the "balance of Nature" can be restored.

There is some difficulty in defining precisely the character and constituents of compost. Though its value as a soil fertilizer does not vary, its composition to some extent depends upon the kind of waste matter used in its manufacture. Essentially,the product known as compost is a vitalized variety of the substances commonly known as "humus" and "sludge."

Compost is similarly related to the kinds of garden earth usually described as rich loam or mould. Leaf-mould of the kind generally prepared and used in gardens is formed by the prolonged rotting of weeds, grass and leaf sweepings. It resembles compost in texture, but it is not a substitute for compost, because it lacks the vitalizing elements which plants need to thrive upon. This is the reason too, why sludge is relatively useless. It is indeed a pity that this clumsy by-product of the modern sewage installation has such poor manurial value. There is some reason to believe that, when activated with the kind of domestic refuse which is carted from our towns, it might yet be of real value in stimulating soil fertility.

The fact of the matter is that leaf-mould, loam, humus and sludge do not possess the vital spark required to set plant life in throbbing motion. On the other hand, freshly made compost, properly prepared and mixed with soil in the right proportion, yields rich dividends in productivity and health

Composting has been known for countless centuries. Knowledge of it is passed on from father to son on farmsteads in China and India, where farming is the occupation of succeeding generations. But in other places and in other lands the procedure of composting has languished, or its production and application have been neglected and misconstrued, because of lack of scientific direction. Greed and ignorance have played a part in the havoc and ruination of the soil which modern methods of agriculture have brought about.

Present-day civilization has divorced large sections of our population from the soil. A process of soil-destruction is now in progress, and will continue until we learn how to replenish the soil by means of waste material, which Nature unaided cannot do.

My concern has been to obtain a broader understanding of the problem as a whole and then to see how, in my capacity of Health Officer, it might be possible to associate existing public health activities with a "Grow More Food" campaign.

Malaya has been in the forefront of the endeavors to develop the practice of composting. Ipoh has a composting plan in operation, managed by the Health Officer. At Ipoh all the town refuse is converted into compost for use in gardens in and around the town. Though the Ipoh plan is unique in the excellence of its organization and scope, it is only one of several such schemes situated elsewhere in Malaya.

In many of the villages of Penang and Province Wellesley the waste matter previously burnt or buried is now composted into valuable soil fertilizer for use in agricultural areas.

In Trengganu, and at Kuching in Sarawak, energetic ef-

(Continued on inside back cover)

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J. I. Rodale—Editor | Sir Albert Howard, C. I. E., M. A., Associate Editor

With the Editor

Vegetable Garden Mulching

WE are practicing mulching in our vegetable garden. Last summer we were fortunate to get a large quantity of hay cuttings from a nearby park system, tons and tons of it merely for the hauling. We piled it 6 to 8 inches high in the aisleways of the garden. It became compressed in a little while to about half the height. We watered it down as it was a windy day and this prevented it from blowing away. We were careful not to get the hay on the rows themselves, leaving a width of about 8 or 9 inches clear.

This is our first attempt at mulching and it remains to be seen how it works out. The advantages are supposed to be that it prevents weeds from coming up, thus eliminating much labor in the garden. The underpart of the mulch seems to stay wet for a long time after a rain thus preventing arid conditions in the garden when there is an exceptionally long period of drought. Such a mulch material is supposed to last for years, being used over and over again. Some of it decays and furnishes organic materials for the soil.

There are other mulching materials such as ground up corn cob, grass clippings and there is a mulching paper on the market which comes in rolls and which is laid down in the aisles. The paper, of course, doesn't permit the rain to be absorbed. We will announce our results with the mulch later.

Compost Heap Mulching

While on the subject of mulches there is another place where it may be used to good advantage and that is the compost heap. On our farm, this year, we are finishing off each heap with a fairly heavy layer of hay, over the last layer of earth. First it prevents weeds from growing on the outside of the heap. (By the way, these should be weeded off as soon as possible, as they use up the moisture and food values of the heap). Second it doesn't permit the sun to bake the compost, drawing off much moisture. In periods of dry, hot weather this necessitates much watering of heaps. Thirdly, it catches much more of the rains and keeps the under portion of the mulch nicely moist. Where an earth-covered heap has been permitted to cake up through drought, and a rain comes, much of it will spatter off the heap. This also is an experiment and results will be an-

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nounced at the end of the season.

Orchard Mulches

There is still another place where we have mulched. We have about twenty fruit trees which have undergone the same treatment. A liberal portion of compost was first spread under each tree reaching out to about two feet beyond the line of outer branches and worked into the soil. None was placed for about a foot or two around the trunk, depending on the size of the tree. Then a hay mulch was placed on top of this compost.

One advantage is the same as in the other two cases, just mentioned, namely to trap and keep rain under the mulch. But a far more important benefit is that it doesn't permit grass to grow under the tree. There is a competition between the grass and the tree, as Sir Albert Howard says in his "Agricultural Testament." In a series of tests at Pusa in India spectacular results were obtained where grass was not permitted to grow under fruit trees. In this case this was done by cultivation rather than mulching, but the effect should even be better with mulching on account of its other advantages. In the Pusa experiments, results were obtained only with fruit trees. Where other kinds of trees were used there did not seem to be any appreciable advantage.

Where a fruit tree has the proper conditions of moisture and soil feeding it becomes a healthier tree and for some reason such healthy trees are not attacked by insects anywhere near as bad as when trees are in poor condition. Like a human being, if it is strong, it can resist disease and produce better fruit. We do not intend to spray any of these trees. No doubt, results will not show the first year, but we feel certain that by 1944 there will be clear proof of the value of this method.

Fruit As Animal Feed

We are raising apples not only for our own consumption but for that of a herd of steers which we are fattening. You may be interested to know about our steers. A few years ago we bought this farm because we had heard of the findings of Sir Albert Howard, and his discovery that modern farming methods with its accent on chemical fertilizers was producing inferior food. We decided to produce as much of our food as possible without the use of artificial fertilizers. We are going into our third season. We have a herd of fourteen steers and about 100 chickens, all fed with the products raised on our own farm such as corn, wheat, oats, alfalfa, soy bean hay, flax hay, etc. Eventually we will have a few sheep, pigs, etc. so that we will be in a position to raise over 80% of the food we consume. We at present purchase a small part of the feed for our steers and chickens, but eventually we expect to produce all the feed ourselves.

We have been eating some of the steer meat and it is really wonderful, much better than you usually get in meat shops or restaurants. Friends of ours who have eaten some of our meat have raved about it. I wouldn't say that this good taste is due to the fact that we are following organic methods on our farm, although that may account a little for it. Our farm was too run down when we purchased it to show overnight results of the new method. It will take two, three or four more years to produce the unusual that we expect from it. But the quality of our meat *is* due to feeding our steers a better diet than the average farmer does, who is guided merely by the profit motive.

The U. S. Department of Agriculture guides the farmer so that he can make a living and work out methods of feeding certain crops which will put on the most fat at the least cost. Around here, the average farmer feeds corn, hay, and sometimes a protein supplement. The protein supplement is very important, because corn, which makes up a large part of the diet, is practically all starch or carbohydrates. There are many farmers who leave out this supplement, feeding only corn and hay. I believe in such cases the finished meat doesn't taste as well nor does it have as much nourishment (vitamins and minerals) as meat from steers fattened more efficiently.

The average farmer who raises steers and also grows wheat, will sell that wheat as a cash crop. He will not feed it to the steers because it will cost him too much per pound of fat. You, dear friend, will not pay the price for the meat, if the farmer did that. In our case we fed most of our last year's wheat and oat crops to our steers and this year we are growing 5 acres of barley to add to the ration. I am a believer in variety of diet, be-

cause it is possible that certain foods have exceedingly small amounts of rare elements and by getting a variety you have a better chance of securing all the needed elements. Why shouldn't this theory apply to animals?

We have planted 10 honey locust trees which in a few years will bear a heavy pod-like bean which makes a marvelous feed for cows, steers, etc. We even intend to feed a small amount of apples as soon as our young trees begin to bear sufficiently. The point I wish to make is that such meat may cost double the price to produce but will easily command double the price in the market because not only will there be the variety of feeds used in producing such meat but, of more importance, these feeds will be raised with organic fertilizers only. The health-giving qualities of such meat will be extremely high and Sir Albert Howard states that people are usually satisfied with less of such food because it has a hunger-satisfying quality. Some of the foods that we get today are eaten, but do not seem to satisfy our hunger.

The point of all this is that farmers tell me that the organic methods we advocate are all wrong for farmers because it means too much work. It may mean extra work at the start, but in later years the soil will be much easier to work and this extra work will be offset. The big thing they overlook is that their produce will be of very high quality and would get them out of the dirt-farmer's class by giving them a better profit. John Public will be better off by paying a higher price because he will not need to visit doctors, and buy medicines to as great an extent as before.

At the present time I am following the usual practice in raising steer meat, that is fattening them up as much as possible, except that some of the feeds we have been giving are higher in protein and put on somewhat less fat than corn and other starchy foods.

Some day I am going to try an experiment. A fat animal may have tender meat, true, but is tenderness a sign that it has the maximum amount of vitamins and nourishing qualities? I came across a few sentences in an old book on animals which set me to thinking. Here it is:

"In the desert are numerous shallow, sandy ravines in which are tufts of a herbage so coarse that as a source of nourishment it would be valueless to a domestic animal. On this gazelles exist; are in excellent condition though they never fatten."

I will raise a few steers on a diet which will not fatten them too much, keeping such foods as corn down to a minimum in their diet and then have vitamin tests made to see whether a healthier animal, instead of a fatter animal, has more nourishing qualities for human beings.

In the years to come many farmers will begin to operate on the organic basis and much better food will be available to the public although at a higher price. The price part is exceedingly important. It is your protection. The sad state of affairs in regard to the quality of today's foods is due to the pauperized prices our farmers have been getting. This is one great disadvantage of the dog-eat-dog competitive conditions which have existed up to now.

J. I. Rodale

The Practice Extending

Extract from a letter to Sir Albert Howard from Mr. James Insch, Mahana, 18 Beechwood Avenue, Boscombe, dated 11th January, 1943.

South Africa and New Zealand are not the only countries forging ahead in this direction. Dr. McKinney, who as a practitioner still has his car, told me yesterday that last week he visited a patient in a district he had not seen since the commencement of the war. He had to pass a large field which for many years has been under allotments. Well, the point is, that on the occasion of this visit he noticed something new. Without exception each allotment now has its Indore compost heap; four years ago not one was to be seen.—*News Letter on Compost.*

Eelworm Disease of Potatoes

By Sir Albert Howard

From THE GARDENERS' CHRONICLE, November 21st, 1942.

In a recent issue of ORGANIC GARDENING there is an article by the same author on the subject. The present communication brings confirmation for his views from two further sources.

IN the issues of *"The Gardeners' Chronicle"* of Mar. 21 and May 16, two articles appeared based on the suggestion that eelworms may not prove to be the real cause of one of the chief troubles affecting the Potato, but may turn out to be a symptom of soil exhaustion.

Confirmation of this view has now come from two independent sources—Southern Rhodesia and Ceylon. The results are summed up in the following extract from *"The Rhodesia Herald"* of September 4, 1942:—

"Some years ago Mr. S. D. Timson, Assistant Agriculturist, noticed a garden in which the vegetables were strong and the flowers bright and vigorous. He was surprised to learn that three years earlier cultivation had been almost abandoned because of the heavy infestation of eelworm. The excellent conditions he saw followed a good dressing of compost.

"He immediately began to observe the results of compost in regard to eelworm, make practical tests and induce farmers to experiment. Once the inquiry was begun evidence began to pour in.

"At Darwendale, Mr. O. C. Rawson had applied five tons of compost per acre to infested tobacco land. In the first year there was a reduction of eelworm, and in the second year, without a further application, the eelworm disappeared. Other tobacco farmers began to report similar experiences. . . The compost, of course, was applied for its fertilizing value, and the consequences on the eelworm population were a surprise.

"It now seems that the same effect has been noticed in other countries where compost was being tested out. In Ceylon, members of the Department of Agriculture were able to report last year that the most promising method of ridding the soil of eelworms was one they had only recently discovered. It had been found that if large quantities of organic material, such as compost, green manure, or cattle manure, were added to the soil the population of eelworms was greatly reduced. Examining into the causes of this effect, their conclusion was that it was due to the increase in the soil, following the addition of organic matter, of organisms like fungi, and insects and other nematodes which preyed on the eelworms. . .

"From Ceylon it is also reported that as research work on plant diseases progressed it was becoming increasingly evident that many of the soil-borne diseases of that island would not be so severe if more cases were taken to increase the amount of humus and organic matter in the soil.

"Plants grown in well-cultivated soils, well supplied with

organic matter, are not affected by many plant diseases to the same extent as those which are grown in the poorly-cultivated unmanured soils."

If a few of the readers of this journal could treat small areas of infected Potato land with compost before the spring and observe the effect on next year's crop, the result might be duly recorded in these pages. As is known, this disease is on the increase in this country, so anything practical which can be done to safeguard one of our chief food crops will naturally help the war effort.

Sawdust as Fertilizer

(A Review of "Dairying Farming With Sawdust" by D. W. Geesaman and T. G. Norris in American Forests—April, 1943.)

By Helen L. Waite

SAWDUST? Can that be one answer to the ever increasing demand for a cheap natural fertilizer? Mr. Wilbur F. Barkdoll of Mt. Alto, Pennsylvania, feels that it is and his experiences (told in a recent article in American Forests by D. W. Geesaman and T. G. Norris) seem to prove it.

For a long time sawdusts, particularly the hardwood type, have had a limited place in agriculture as a mulch for evergreen trees and shrubs since it will sour the soil for these acid loving plants. But this tendency limited its use in more general farming since it was particularly unfriendly to the legumes.

Mr. Barkdoll however solved this problem of acidity in a novel and what seems to be a practical way. He found that by adding the urine of cattle to the sawdust it was possible to change its content to be slightly alkaline. (The exact change which Mr. Geesaman and Mr. Norris give is that raw oak sawdust untreated would test about PH 4.5—after treatment with the urine of cattle this would rise to 7.0 or 7.5 which is on the alkaline side.)

When Mr. Barkdoll bought his farm over 25 years ago it was more quarry than field. Sixty three acres were a stony loam; the remaining twenty five in limestone. Tons of this stone was removed by Mr. Barkdoll before even simple plowing could be accomplished.

Confronted on possession with a mud floored barn, Mr. Barkdoll cemented it but laid no drains in the gutters he made back of the stalls. From the first he used wood shavings and sawdust as bedding. Since no drains were present this wood bedding, which has a higher absorption capacity than straw, took up all the waste. The gutters were cleaned twice daily, morning and evening, and the manure spread directly on the field. The gutters are then refilled with approximately an inch of shavings or sawdust and the cows are bedded generously with more of the same material.

Mr. Barkdoll's first crop of wheat was 15 bushels to the acre. Since then he has attained as high as 45 bushels. His original corn yield was 75 bushels which he has increased to 198 bushels. The farm which found it hard in 1918 to support 2 horses and 20 cows now carries 6 horses and almost 60 head of cattle—to say nothing of a flock of poultry.

In fact, so outstanding have been Mr. Barkdoll's achievements for which lowly discarded waste sawdust is largely responsible that in 1942 this ingenious farmer was made a Master Farmer of Pennsylvania, a signal honor.

Mr. Barkdoll's county agent, J. H. Knode, made this state-

ment regarding the farm's hay crop which increased 22 times: "Reducing this thirty-two tons an acre of green hay to a dry basis at the rate of 75 percent moisture in the green hay and twenty per cent moisture in the dry hay, the yield is twenty tons and twenty pounds of dry hay which I believe constitutes a record for this section of the state."

In addition to the sawdust Mr. Barkdoll has added other materials to his soil—some good—some bad—hydrated lime, marl (a quarry by-product chiefly clay and calcium carbonate) pulverized limestone, superphosphate and commercial fertilizer.

The wood products however have bulked by far the largest. Three tons per year per acre over a period of 25 years is the average—which amounts to a layer over the whole farm almost 3 inches deep.

Mr. Barkdoll's experience, as reported in American Forests, have proved that the mill waste decomposes quickly and no pieces are turned up in plowing or harrowing.

Readers of *Organic Gardening* might assay Mr. Barkdoll's practices in the light of the more scientific principles of organic farming.

First, to try the use of the sawdust principle in dairying as a bedding and subsequently as a fertilizer with good humus characteristics. The whole to be used independently without supplementing it with commercial fertilizer in any form.

Secondly. it might be used as another vaulable component in the compost heap. In this role, continued experiments should prove its worth. Sawdust is a plant material, is clean, easy to handle and is already broken down to hasten decomposition. In the compost heap in combination with organic substances it should assume alkaline characteristics.

The cost is cheap; lumber yards and mills are frequently glad to dispose of it for nothing or for a small sum, in any instance Mr. Barkdoll considers it an economy to maintain a truck solely for hauling sawdust and he gladly goes as far as 20 miles for his sawdust. In fact using the sawdust as bedding instead of straw (when straw was $15 a ton last year) Mr. Barkdoll saved more than $3,750 in a year on this one item.

Indeed, in the waste of the mill we find a fertilizer so valuable that the long neglected sawdust pile will be worth the gleaming gold dust it so closely resembles in rebuilding starved fields.

Hints For the Victory Gardener

BEANS

This is the sixth of a series of articles by this author dealing with the cultivation of ordinary vegetables.

By Roger W. Smith

BECAUSE they produce more edible material to the foot of row than any other ordinary garden vegetable, beans are essential to every Victory garden.

In order to better understand the plants, you will find it convenient to have some idea of their origin.

Large seeded limas were introduced into the U. S. A. by Captain John Harris of the U. S. Navy in 1824 when he brought home a few seed beans from the then little known city of Lima, Peru.

The edible podded beans, on the other hand were great favorites with the North American Indians who had developed

them. When they were introduced into Europe they received a great welcome in spite of the fact that the bean of history, much like the lima but an ancient native of Asia, was a great favorite.

To even the score, we received the wax bean which had evidently been perfected by the Moors of North Africa.

Beans may conveniently be divided into two main classes, edible or green-podded and limas.

Because of their productiveness, edible podded beans deserve your first consideration. For in spite of all the competition from beans of foreign origin it remains for the native American bean, the edible podded bean of the climbing type, to out produce all other varieties in the production of edible material for any given garden space.

Edible Podded Beans.

When you grow them you will find that pod-beans, that is all the varieties in which the pods are edible, both bush and pole types. demand a temperate and warm location. You will find that they can do best in an open, sunny part of your garden preferably one that is sheltered somewhat from the north by a building or by a w i n d-break.

Beans should not be planted until after the ground has warmed up. They thrive best in a warm, fertile loam which has been properly augmented with a liberal amount of mature compost humus.

When you grow them you will also find that the development of virile, disease resistant plants demands not only an ample supply of natural plant food but the ground in which the plants are to thrive must be well drained. The often referred to "well drained spot" is simply any part of your garden where the rainwater soaks away easily and does not form a pond for any length of time. Thus drainage largely depends upon the formation of the subsoil.

Pod-pole beans come first with the Victory gardener because they have the advantage that they may be planted to cover a fence or trellis and thus produce a fine crop without reducing the available garden space. They are a boundary line vegetable and, like the squash, can be used to cover the extreme edges of the garden. One pound of seed is ample for three hundred feet of fence row or one hundred poles and costs very little.

Whilst types like Kentucky Wonder (formerly known as O l d Homestead) which matures in sixty-five days, do well in almost any well drained garden soil, you will find that sturdier, more productive vines will result if a quantity of good compost humus—about one wheel barrow load to a hill—is dug into the soil before the seed is planted.

You will, of course, understand that all composted material which is to come into contact with seed beans should be mature, it should have passed the "heating" stage.

All bean seedlings should receive sufficient drainage even though you have to dig shallow trenches with the corner of the hoe between the rows to prevent the stagnation of surface water. This is important because seed beans often fail to germinate because of the action of moulds encouraged by the environment resulting from improper drainage.

You will find that the sprouting and early growth of bean plants will be greatly improved if mature, finely sifted compost humus is supplied around the seed. This material has much the same effect of many of the much-advertised "seed bean inoculants" and c o s t s you nothing compared to the exorbitant price charged for t h e manufactured material.

In preparing a planting of pole beans, you will find that it is best to get the poles into position first. These should be rough-surfaced and tall enough to stand seven feet or m o r e above the ground after being sunk two feet.

The poles should be set three or four feet apart in the rows and the rows should be four feet wide.

If your garden is in an open position which is exposed to excessively high winds. it is wise to set the poles in tepee fashion. That is, they should be sloped and joined together in threes and the tips tied with stout cord.

In planting pole beans it is wise to put them at the northern end of the garden so that they may shelter rather than shade the lower growing vegetables.

After the poles are in position, plant five or six seed beans about two inches deep in a circle close around the base of each pole. Firm the s o i l properly to assist in germination. As soon as the seedlings appear, thin out the weakest so

that there remain about four to a pole.

For a touch of brilliant color, something that might bring a few words of admiration from the Victory gardener's wife, it is a good plan to plant a few Scarlet Runner beans (65 days to maturity) at the ends of the rows.

This bean produces large, showy flowers suitable for use in the house-sprays of bright scarlet. Yet the pods run from six to eight inches in length, are broad and thick, and the bean itself when gathered before reaching maturity is considered especially delicious.

Or you might prefer wax-pole beans for variation. There are several of these which are very heavy bearers for you to choose from. Often the utterly fresh, crystal clear appearance of the wax bean makes it a favorite for family use.

To go from the pole type of edible podded beans to the bush types, you will find that the bush types have much to offer. These are available both as green-podded and wax. They are considered hardier than the climbing types so they may be planted a week or so earlier. Their cultivation is easy and the height of the bushes is such that they do not shade the other plants in the garden.

Only fifteen to twenty inches tall, the little plants produce an amazing quantity of the best quality pod-beans.

Bush types differ slightly in the manner of bearing. For this reason they are often sown every two weeks until late August to produce a succession crop.

Bush beans respond favorably to the addition of mature compost humus and find in it the materials essential to their high production.

In arranging the rows, which should not be closer than twenty inches apart, it is well to make a trench where the row is to stand. Fill this trench with rich compost humus and plant the seed beans two to three inches apart. They should be covered about two inches deep and well firmed.

One pound of seed will sow one hundred and fifty feet of row and produce a prodigious amount of fine foodstuff.

This amount of seed may, of course, be easily divided into the planting of many short rows seeded at two week intervals. This is one of the great advantages of the bush type of pod-beans, they may be planted at periods so spaced as to supply a steady quantity of edible material very useful to the family over a long period.

As with pod pole beans, you have much to choose from. There is the Giant Stringless Green-pod (51 days to maturity) and the Bountiful (48 days to maturity) among the green-podded varieties.

There is Brittle Wax and Stringless Wax (both 50 days to maturity) and Black Wax, among the wax varieties.

Whichever you choose from this large and colorful assortment, you will find that it will pay you to select only the best seed, especially that which is graduated to be free from seed born disease and disease resistant.

Pod-beans are descendants of our own native, wild stock. They formerly succeeded in the wild. They succeed best where they have free access to open sunshine. Many leaf diseases are encouraged by improper surroundings, dampness and lack of free air circulation and infected seed.

To make the soil in which seed beans are planted suitable for the penetration of the vast number of hair roots which have the heavy job of supplying the great crop of pods with the plant food they need, and to supply this plant food, it is always advisable to dig into the soil which will be used by the roots a large quantity of compost humus.

Pod beans are subject to occasional attacks of bean beetles. You will find it advisable to hand pick these pests while the plants are small. This will tend to prevent their rapid increase. Bean beetles come and go at very definite periods. You will find that you can seriously upset their timetable by doing a careful job at the right time.

However, it is amazing to see the tolerance strong growing vines have for insect pests. It is not unusual to find sturdy vines producing their crop of beans in spite of the fact that bean beetles have done their foliage much damage.

More damage is often done to the production of the vine by the failure of the gardener to pick mature beans than is done by the bean beetles. All mature beans should be gathered. Only one or two left on a plant will do much to prevent the formation of others.

Lima Beans

Lima beans should be thought of as quite distinct from edible-podded beans. The larger podded of the limas re-

quire at least ninety days of sunshine in which to mature.

Pole limas may be grown very nicely to cover a fence. They are planted much as pod-pole beans except that the seed (five or six to a pole) should be planted very carefully with the eyes down.

This matter of planting with the eyes down is important because when the seed sprouts the growth emerging from the eye has to force the sides of the divided seed up through the surface of the ground. The divided and opened sides of the seed bean are the first to appear. If the seed is planted with the eye upwards, the seed has to reverse its position in the ground during growth which is a very wasteful and delaying process with a seed as large as a large lima.

The seedlings should be thinned to three or four of the strongest to a pole.

One pound of seed is enough for fifty poles. If you are planting along a fence row you will find that the plants will not be overcrowded if set at intervals of a foot.

Whilst it is true that pod-beans out-yield limas, it is also true that freshly gathered limas are a distinct improvement to the family menu.

Perhaps when you grow them you will settle the question as to whether or not pole limas taste better than bush limas. Whatever your answer, you may be sure that fine limas grown in good garden soil to which the natural plant food contained in good compost humus has been added, not only produces finer and healthier plants but that these plants produce crops much more flavorsome and health-producing.

Pole limas will climb as high as twelve feet under proper conditions. So you will find that although you can use regular bean poles it is advisable to secure extra strong ones.

An excellent plan with pole limas is to arrange to have them divided, some to cover a fence the others to climb on poles and form a shelter at the northern end of the garden.

The bush types of limas mature earlier than the pole types. They do not shade the rest of the garden and are easy to handle in a small place. There are few finer sights to meet the eye of the meticulous gardener than tidy rows of bush limas.

It is well to remember, whilst admiring these neat plants, that the first bush lima plant, which originated as a sport, was discovered growing by the roadside near a large planting of pole limas by a negro laborer.

Pole limas were the only kind then in existence. The negro laborer admired the little bush lima, saved the seed. His name has long since been lost from historical record but the little bush limas remain to brighten the heart of every Victory gardener.

Seeds for bush limas are best sown eyes down ten inches apart in the row with the rows three feet apart and the seed covered with about two inches to mature compost humus.

Limas should receive careful attention until their blossoms appear. Their cultivation, in fact the cultivation of all beans, should be shallow, to prevent damage to their shallow growing root system.

The arrow-head foliage of the limas is much less apt to be attacked by bean beetles than the tender foliage of the pod-bean varieties.

But regardless of the type of bean, it is most advisable not to cultivate the plants nor to handle them when they are wet either with dew or rain. The spread of certain kinds of fungus diseases of the leaves depends much upon moisture for their existence and the handling of the plants when they are wet spreads these diseases.

If you find you have, towards the end of the summer, a much greater supply of beans than can be reasonably consumed by the family, it is a good idea to suggest to the Victory gardener's wife that she look into the matter of preserving a quantity for the winter use of the family.

If you have become interested in the growing of beans you will find ample room for a little experimentation. You might decide to try out the Garbanzo (the bush bean of Spain) or one of the giant limas, or some of the excessively long pod-beans.

Perhaps your first choice should be to determine that next year you will plant a few rows of that most ancient of all beans, the Mazayan, Broad, or Windsor bean.

This is the bean of recorded history. It is of ancient Asiatic origin. The seed is sold today under such names as the "Frost-proof pea" and "Lima pea." It is very valuable in that it differs from other beans and may be planted quite early in March (long before the soil warms up) at the same time

peas are being planted. It thrives only in cool moist weather.

Otherwise the seed should be planted the same as bush limas. The plant will probably surprise you. It is erect, two to four feet high, having much the appearance of a lupine. The flowers, arranged in rings around a central stalk, are black and white. They are noted as being the nearest to pure black of any known flower.

The beans themselves are large as the largest limas. The pods being about five inches long and one and a quarter inches wide. They should be picked as with limas.

This early bean is worth your while because it comes into bearing long before ordinary limas have even reached the flowering stage. And the beans themselves have a most unusual flavor.

And when you enjoy the growing and eating of them you might pause to think of their long history. These are the beans of the Romans, of biblical times. The ancient men who developed them so that they would flourish under incredibly cold and wet conditions, should receive your admiration.

A Case Against Artificial Fertilizers

By Cecil D. Bachelor

THE CROSS AND THE PLOUGH (England)

ONE hundred years ago Baron Liebig, on analyzing the ashes of burnt vegetation, revealed that plants consisted of Nitrogen, Phosphates and Potash. From this discovery he deduced that all then that was necessary for the successful growth of vegetation was the incorporation of these elements, in chemical form, into the soil.

This theory very quickly became popular with the agricultural community, who proclaimed it a wonderful discovery; its application meant that with two or three bags of chemicals, soil fertility could be restored in, virtually speaking, a matter of hours. Gone were the days of laborious muck spreading: staffs could be reduced and costs lowered. The farmer was happy with this new-found salvation, and so was Commerce; for here, indeed, was a golden opportunity for them to sell their hitherto unmarketable, and unwanted, waste: basic slag from the smelting works: sulphate of ammonia from the gas works: and so on.

A great propaganda campaign was launched, those with more commercial interest than agricultural encouraging the use of artificials at every turn; the Government sacrificing the soil to the gods of commerce and welcoming the new method of farming which could produce cheaper food, gave the doctrine of artificials their unreserved blessing, and through their agricultural research stations expounded its benefits and urged its use. The ball of soil destruction had been set rolling, and it has been gaining impetus ever since, with the disastrous results so apparent to-day.

Commercialism and soil do not mix: no "get rich quick" system of farming is ever sound, or in the long run practicable, because it is not Nature's way and no man can beat Nature. He may, for the time being, think he is forcing her to give up her treasures, but ultimately Nature presents the bill of costs which has to be paid by man either in the form of loss of soil fertility, the nation's health, or both.

Digressing into another line of thought for a moment, let us consider our own bodies. Scientists know that the human body consists of so much lime, phosphates, etc., they also know what quantities of pro-

teins, vitamins, etc., are necessary for us to consume to maintain these bodies of ours. Working, then, on Liebig's theory, could we not nourish ourselves by taking these proteins, vitamins, etc., in concentrated form? Is it necessary for us to eat large meals when we could obtain the same nourishment from one small chemical pill? The answer is obvious; even supposing this concentrated food did sustain us, it is extremely doubtful if we would be strong, active, or healthy because it is not Nature's ordained way for us to feed; she has given us digestive and other organs, wherewith to extract these proteins, vitamins, etc., from animal and vegetable matter, and unless these organs are used our bodies suffer in consequence.

The same conditions apply to vegetation and soil; certain elements must be present to obtain the best results, and these elements cannot be supplied in an artificial manner.

The soil, as we know, is a mass of living bacteria, and these bacteria have to be fed. The diligent earthworm, who works so hard constantly aerating and tilling the soil, also requires food, likewise the fungous growth, mycorrhiza. which converts organic matter into plant food, and whose presence in the soil is so essential to vegetable life. Factory-made chemicals, far from feeding these elements, kill them, and kill them off without mercy. Dig over ground which has been treated with artificials for a number of years; how many earthworms are there to be found? What trace of mycelium is present? None! The earth is dead: all the living matter has been poisoned: what manner of vegetation can this dead soil be expected to produce? How can roots of plants obtain nourishment from a soil so denuded of its natural elements?

It is true that even on such soil, crops can be grown by artificial means, but what do these crops consist of? Are they not simply artificial matter? Factory-made chemicals! Surely the mature plant is nothing more than synthetic vegetation, containing only such nourishment for man and beast as a factory-made cabbage would be expected to contain.

If chemicals are the sole necessity to vegetable life, why trouble to use the soil at all? Why not produce our corn, cabbage and carrots in the laboratory straight away?

One has only to consider the dust-bowls of America to appreciate the ravages of artificials; thousands of acres completely derelict in less than a hundred years! Compare this with the Orient, which has fed hundreds of millions of people for countless years. The Orient, excepting that small portion cultivated by commerce, follows Nature and relies upon her method for maintaining soil fertility.

The disastrous result of using artificials, apart from the loss of fertility, is well illustrated in the Ceylon tea-growing industry. Tea grown on Ceylon soil has a flavor peculiar to itself and unequalled by tea grown in any other country. By using chemical fertilizers, however, this tea is rapidly losing its fine flavor and is becoming on flat parity with that grown in other countries who fertilize their estates with similar artificials.

Commercial greed is the only reason for the use of artificials: the raping of the soil for the benefit of the few, to the detriment of the health of the present generation and the total loss of soil fertility for the generations to follow.

No artificial fertilizer can replace that all-important soil ingredient—Humus. The very life of the plant and soil depend upon it for healthy existence, but because humus is Nature's own patent and not Man's, it is despised.

Nature decrees that animals and vegetation live on the same organic substance—animal and vegetable matter; humus supplies this to the vegetable world. The excreta and dead bodies of animals; insects and birds, the decaying leaves and vegetation are mixed and oxidized by the action of the air, wind and rain: this compost is conveyed into the soil by worms, ants and other burrowing animals and insects, and by this process soil fertility has been maintained for countless generations. Man can do no better than copy this example.

Disciples of Liebig maintain that the shortage of organic matter and the labor required to make, and spread, compost is the argument against its use; this argument, however, is hardly convincing when we consider that prior to the present war we had, in this country alone, some two million unemployed and practically all our household and commercial vegetable and animal refuse was either burnt in the Mu-

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nicipal incinerators or consigned to the tip.

Unless drastic steps are taken, and taken quickly, to put humus back into the soil, the present-day extensive cropping and artificial programme will leave us in a very sorry state for many years to come.

A Testimonial to Compost

News Letter on Compost

Dear Sir,

Thank you for lending me the "Report on Garden Competition," 1941, and *The News Letter on Compost,* No. 3, read with much interest.

You may be interested to know of the results of my own amateur gardening efforts over the last five years which have been in ignorance of sound theory and practice of cultivation.

I dug up 200 square yards of lawn, turned in the turf and grew a few odd savoys the first year. Following that I made a compost heap—entirely for neatness and to find accommodation for "Garden rubbish." This heap consisted of flower stems, Delphinium, Lupin, Hollyhock, etc. Vegetables leaves and stalks intermingled with layers of soil.

To dispose of this collection I trenched about 18 inches down in rows about the same width and put about 3 inches of this compost over the bottom. This I covered with the soil previously dug out, sprinkling a little bone meal into the trenches when about half full. In these trenches I sowed Peas, Broad Beans, Runner Beans and French Beans. I also made an onion bed on similar lines.

The remainder of the garden —on account of shortage of labor—and of my time—was only dug over and dressed with artificial manures, superphosphate, sulphate of ammonia, etc.

A rotation of crops was maintained and the area divided into four beds: one quarter being left fallow every winter. The results are very much in line with those described in the papers about compost sent me. Namely that the Peas and Beans and Onions have yielded extremely heavy crops every year. People have commented on my success with them; whereas the Brassicas, which were invariably in the ground manured with artificial have become poorer each year. Cauliflowers have not flowered, club root appeared, sprouts produced very poor crops and savoys have not hearted. This was in Gatley, Cheshire. Since reading your papers the reason is obvious.

I thought you might be interested in this because the experiment was quite accidental and unbiased and yet was consistent over five years.

My future efforts will be more wisely directed I hope!

Many thanks for the valuable information I have learned from the leaflets.

Yours faithfully,

R. S. A. Larmuth.

The Old Vicarage.

Holmes Chapel.

Fertilizer Shortage in Canary Islands

Supplies of chemical fertilizers required for intensive cultivation in the Canary Islands continue difficult to obtain.

During the fourth quarter of 1942, 2,200 tons of nitrate were received from Chile, and some dried blood was received from Argentina. About 2,000 sacks of potash came from Spain.

The use of organic fertilizers is recommended by the agricultural authorities, but quantities available are not sufficient.—*Foreign Commerce Weekly.*

Cover Crops

A good crop of alfalfa, red clover or wild white clover will fix in the soil as much *nitrogen* per acre as 250 to 1,000 pounds of ammonia fertilizer.

A Garden in Gold Coast Colony

Extract of a letter from John Picton, chief engineer of the Ariston Gold Mine. (News Letter on Compost)

NOW I suppose that you will want some gardening. The garden now is feeding an average daily lot of sixty to sixty-five persons with two or three or four vegetables each. The total area actually cultivated is not 240 square yards quite. I don't think it's too bad, do you?

The garden lies on the lower slope of a gentle rise facing southeast, and extends out about thirty yards on to the flat. This flat is an old broken outcrop area, and is therefore strongly acid with the acids derived from the auriferous material. On top of the gravel there is about three to four feet of forest earth washed down from the slopes, and this forest earth also formed the base for the whole garden, when it was first cleared from the bush in 1937.

However, the garden is by no means forest earth now, as compost has been added all the time, some made from the "Adco" powder, but in the main made with the manure from the herd of cattle that are slaughtered for meat. It's Tetse country and so you cannot keep beasts long here. This means that the amount of manure available is very variable but as there is such an absurd prejudice against the use of night soil we have not been able to use that enormous source of material, as its use would certainly have restricted the consumption of the garden produce to a few folk who were sensible enough to realize that night soil, composted, is not only quite safe, but better than safe, on account of the positive destruction of various disease elements in the night-soil, which takes place in composting. The main reason of running the garden at all is to give the European staff the vegetables that they are accustomed to, and which they cannot readily obtain in this country otherwise.

Compost is made in surface piles, about five by five by thirty feet and the material consists of anything from grass to palm leaves and the trunks of old Paw Paw trees, with the whole range of garden waste between. The Paw Paw trunks and palm leaves are used to form a core to the pile, being laid on the ground along the centre line, about one foot thick. The process benefits genuinely from this air-passing core.

The pile is then made up as customary with alternate layers of waste material and manure, to a height of five feet, with a small amount of earth thrown on each layer of manure. The whole pile is next covered with a thin coat of earth, and then with palm leaves, which help to ward off strong sun, and so prevent wastage of moisture from the pile.

After about five weeks with daily waterings either by hose, bucket, or rain, which has to be seen to be believed, the pile is cut up and re-stacked and covered. Then, after a further three to four weeks it is ready for use.

The earth under the pile is also dug up to a depth of four to five inches and used as compost. Fresh earth or sod is brought to fill up this hollow and a new heap is started in the same place. An addition to the soil manufacture carried on, is to stack sod to a height of five feet, in piles about six by six feet, and allow the rain and an occasional wetting by hand to rot the mass, until it is rotted enough to dig in to the beds. This materially assists the formation of good growing beds with a smaller amount of the genuine compost. I am indebted to Mr. Walters, of the

G.C. Agricultural Dept., for this last idea.

Lime, of which there is a constant supply from the mine, in the form of used carbide from the miners' lamps, is used on all newer beds about once in two months. A handful to the square yard. This is because the very rapid leaching which the rain causes makes it hard at first to keep the soil on the Alkali side. A little lime is also used on all the beds from time to time, for this reason also. With the rainfall we have here its too much to expect, even from compost, to keep a *Ph* higher than seven for long.

We grow lettuce, cabbage—the drumhead variety seems to do best—carrots, white turnip, sweet potato, radish, beet-root, kohl rabi, onions (both African and European varieties), tomatoes, of which the special wilt resistant kinds do far the best—we get these from Kumasi Agricultural Dept.—melon, cucumber, grown on sloping frames close to the ground to keep a damp atmosphere about them, capsicum peppers, red peppers, bringalls, native "garden eggs," "okro" (okra elsewhere), kale, spinach, native and English varieties, beans of the dwarf, climbing, string and butter varieties, and a native bean which runs about three feet long in a good spec. The butter variety is native, but contains some form of cyanide, and is apt to cause sore bellies in most folk.

Then we have spring onions, artichoke, which flourish here, and squash, and also a hybrid from South Africa called chard, though it's also called Swiss chard. It seems a cross of lettuce and celery and is a good vegetable. Then there is corn and pineapples, and a big plantation of bananas though this is outside the garden proper.

Simple rotation of crops is practised, under the slogan of "Roots, leafs, fruits," words which can be understood by the gardeners. Seedlings are covered with the ubiquitous palm leaf to protect them from both rain and strong sun, leaf plants are seeded in boxes first, then planted out into seedling beds and finally planted into the beds proper. This has been found to be the best way to get strong growth in the damp, hot climate here. All roots are best planted straight into the beds.

The Wheel of Health

The amazing story of the Hunzas in India who followed the organic mode in their agriculture.

By Mildred Jensen Loomis.

ALMOST all medical research is a study of disease. *The Wheel of Health*, a book by Dr. G. T. Wrench of London, is a research in health, a study of the Hunza people, claimed to be one of the healthiest people in the world.

In a cleft between Himalaya walls ten to fifteen thousand feet in height, where India meets Tibet and Turkestan, lies the habitable part of Hunza. Europeans do not live there, but from explorers, missionaries and officials who have used the Hunza men as porters comes a constant paean of the physique and excellent health of the Hunza: "It is quite the usual thing for a Hunza man to walk sixty miles at one stretch, up and down the faces of precipices to Gilgit, the capital, do his business and return direct."

If there is anything to try the nerves and give the equivalent of neurasthenia, it is the danger and exhausting work of porterage. Many porters give up. Not so the Hunza. They know neither the fear nor the weariness which spoils the will. Report from the Royal Geographical Society, 1928: "The Hunza men were with us

two months, continuously on the move, over what is probably some of the worst country in the world for laden men. Always ready to turn their hand to anything, they were the most cheerful and willing set of men with whom we have ever traveled."

What accounts for this superior health? Not climate or surroundings, for people of Ghizar, sixty miles away, are lazy—and lacking the energy to store food and are usually starving in the spring. And the Ishkomanians, whose valley is parallel to that of Hunza, are poor, undersized, undernourished creatures. Having plenty of land and water, they do not cultivate it with thoroughness, and have no masons or craftsmen. The Hunza, however, are capable agriculturists and outstanding craftsmen. Their big irrigation conduit, the Berber, is famous everywhere in Central Asia.

The real secret of the Hunza health was discovered by Robert McCarrison (now Major General) English Agency Surgeon at Gilgit, 1904-11. Though the Hunza were among his official patients, Dr. McCarrison rendered them treatment only for accidental lesions for he refers to them as a "race unsurpassed in perfection of physique and in freedom from disease in general, with an extraordinary long span of life."

Dr. McCarrison was a born research-worker, and for a long time held the traditional outlook of medicine, i. e., toward disease rather than toward health. After some experimentation to discover the cause of goitre and cretinism, he turned to observation of the Hunza. Then his conventional attitude toward medicine changed to an over-riding interest in healthy peoples. He began to put the question, "How is it that man can be such a magnificent creature as the Hunza?"

His conclusion was that "health is wholeness." Instead of looking from disease to average health, he now looked from these perfect specimens to the innumerable ailments and diseases of men. In 1922 in his Mellon Lecture in Pittsburg, he said, "During my association with the Hunza I never saw a case of asthenic dyspepsia, of gastric or duodenal ulcer, of appendicitis, of mucous colitis, of cancer. . . . Among the Hunza the abdomen over-sensitive to nerve impressions or fatigue or cold was unknown. Indeed their buoyant abdominal health has, since my return to the west, provided a remarkable contrast with the dyspeptic and colonic lamentations of our highly civilized communities."

In 1927 Dr. McCarrison undertook to discover whether the amazing health of the Hunza could be duplicated by experimental science. He put a colony of albino rats in good conditions of air, sunlight and cleanliness and fed them a diet, —prepared and cultivated as the Hunzas did—based on that of these people; i. e. wheaten bread, barley and millet, sprouted pulse (legumes), a variety of vegetables, fresh raw milk, buttermilk, butter, cheese, an abundance of water and meat and bones once a week.

From birth to the 27th month (corresponding to 55 years in humans) 1,189 rats were watched; and then killed for careful post-mortem examination. The results were remarkable. Disease was abolished. Dr. McCarrison reported: "During the past two and a quarter years there has been no case of illness in this universe of albino rats; no death from natural causes in the adult stock, and but a few accidental deaths, no infantile mortality. Both clinically and at post-mortem examination this stock has been shown to be remarkably free from disease." Perfect health had been transferred by *food* (not by hygienic sanitation).

Other rats, under the same physical conditions as the "hunzarized rats" were fed the customary diet of the poorer peoples of Bengal and Madras—rice, pulses, vegetables, condiments and a little milk. This opened the lid of Pandora's box, for these faultily fed 2,243 rats got diseases of every organ they possessed—conjuctivitis, sinus, pus in the ears, adenoids, dilated stomach, gastric ulcer, cancer; inflammation of the uterus; death of the foetus, premature birth, haemorrhages, loss of hair, dermatitis, enlarged pancreas, nervous ailments and polyneuritis, cardiac and heart troubles.

To another group he fed the diet of the poorer classes of England—white bread, margarine, sweetened tea, boiled vegetables, tinned meats and jam. The rats grew nervous and were apt to bite their attendants, and by the sixteenth day, they began to kill and eat the weak ones among them.

Dr. Wrench insists that good health depends on a good start —a good diet on the part of the

mother so that from inception the new speck of life is fed by a healthy blood stream. A "good start" includes breast feeding—a continuation of the same type of food as the blood stream nourishing the foetus. Any change in the nature of food is risky to the young life and may lower the whole level of resistance for a lifetime. He indicts "fragmentation," the breaking of food study down into elements, and putting them together in various ways instead of developing a diet which promotes optimum development of the whole body. He proves that in almost all cases of disease the primary cause is faulty food, though text books and doctors name such secondary features as "old age, debilitating habits, germs, chill, previous attack, exhaustion," etc.

The most conspicuous feature of the Hunza diet is the large quantity of fruit they eat; fresh in summer and at other times dried. Apricots and mulberries are abundant—even the animals take to the fruit diet.

Nothing is eaten before going out in the early morning to the fields; after two or three hours of work, bread, pulses and vegetables with milk; at midday, fresh fruit or dried apricots kneaded with water; in the evening the same foods, with meat on rare occasions. Their grains include wheat, corn, barley and buckwheat. They use much leafy green food; vegetables, peas, beans, gram or chick peas; fresh whole milk and buttermilk clarified butter (heated milk-fat); cheese; sometimes wine from grapes. They do not take tea, coffee, rice, sugar or eggs. Chickens destroy crops and are not kept.

They eat nature's grains as they are; the whole product, ground between stones. No giant mills to sift out the brans with their protein and minerals, or the germ with its vitamins.

All Hunzas drink milk; fresh in cold weather, sour in warm, and buttermilk. (Dr. Wrench points out that any process including pasteurization which comes between fresh raw milk and the consumer delimits its health-giving qualities).

In general, Hunzas are lacto-vegetarian feeders. Vegetables usually eaten raw; washed clean of soil but not scrubbed to remove the precious skin (especial life-giving elements immediately beneath the skin). They are fond of raw green corn, young leaves, carrots, turnips; and because there is value in germination, they sprout their pulse. When vegetables are cooked it is in very little water (something like steaming) and all vegetable water is drunk. Meat—once in ten days or on festival days—is cooked slowly for 24 hours with vegetables and wheat. They also eat sun-dried raw meat. Dr. Wrench pronounces the heating and boiling of food the chief sophistication of westerners, very destructive of Vitamin C.

The amount of food which an individual Hunza eats is left to his personal appetite and choice. Because his food is kept natural, instinct, for *him*, (not for us) is a reliable guide to food intake. The health of the Hunza prove their food. And the chief superiority of their food is its cultivation. *Method of food culture is primary, radical and fundamental to health, and exceeds all other aspects of nutrition.*

The Hunzas have irrigated, staircase terraces over the whole side of the debris-filled floor of the valley between cliffs, the downward edge of each terrace supported by a strong wall of stones fitted without mortar. The cultivated flat surface is some five square miles, population 14,000. Twenty small fields often make up one acre, all irrigated by water brought from the Ultar glacier in canals constructed across the face of these precipices. Advanced social organization of these remote and ancient people regulated the distribution of the water over the land. The remarkable physique of this people is not causeless nor accidental, but preserved to them through food, resulting from constant and meticulous devotion to its cultivation. The final riddle of food and health lies not in laboratories but in the fields and the study of men of boundless health.

Modern man is diseased and degenerating. His plants are likewise full of diseases—deficiencies, excesses, virus, parasites, moulds. Man has made his plant life in his own image, as a book like Prof. Heald's (1935) *Manual of Plant Diseases will show.* Scientific skill has brought about many changes in plants and transfers from one place to another, yet nature hits back and she hits back with disease.

From these changes, plant-life in Hunza has been exempt. The plant food there has continued constant century after century. Yearly there is the renewal of the soil by the black

glacier salt, and the direct reparation by the Hunza of their manure. They use everything they can return to the soil—cattle manure, vegetable parts and pieces not used for stock food, fallen leaves, human sewage from privies after six months, silt from recesses in their irrigating channels, wood ashes from fires; all these are mixed together and made into a compost. This, along with alkaline earth from the hills, they spread carefully on their vegetable fields. In Hunza (as in China, Japan and ancient Peru) agriculture is a gardening, a care of the soil, a repayment of the soil, carried on by men and women with never-ending industry. Prof. N. I. Vavilov, famed botanist who has studied ancient agriculture says, "It may perhaps be that it was in the country of Hunza that in the distant past this form of compost-culture first came into being in Asia."

It is possible that in this form of culture there is an excellence of vegetable health, obtainable by no other means. In Hunza there is that excellence. Plant disease is insignificant. By full return to the soil—rather than by scientific doctoring by way of nitrogen, calcium, phosphorus—we get a full return. Doctoring only patches disease it does not abolish it. For progress we must look backward to a period and type of agriculture in which vegetable and animal life were mutually healthy. Three transferences — soil to vegetable, vegetable to animal, animal and vegetable back to the soil—form the eternal Wheel of Health.

Humus—Soil Erosion's Arch-Enemy

By J. Hunt Holley

(From THE FARMER'S WEEKLY, Bloemfontein, South Africa, October 14th, 1942).

SOIL erosion has interested me for sixty years. I remember a warning in the early eighties against veldt-burning, which has ruined millions of acres of tropical and sub-tropical land.

At the end of last year I went on planting maize (corn) from October until the following January. Much of this was a catch crop, 8 ft. apart with gums growing in between, the bulk of it being planted on ground that had not been ploughed for three years, or even harrowed, and in the same area I had a small patch of very fine mealies on ground so rough and stony that it has never been ploughed. The slope in some places is so steep that it is hard work to walk up them. The maize and tree lines ran right up and down the hill. Yet there has been no erosion, save for slight damage where firebreaks used to exist. On this area where the previous owner, who practised burning, could only grow a few wattle trees—I have produced the finest potatoes, peas, beans and tomatoes. On some of the ground, where last year I planted gums, the weeds and grass were 8 to 10 feet high at the end of the summer.

During the past seven years a neighboring farmer has had 54 floods. We had none, despite the fact that we have from 100 to 300 per cent more fall in our streams. In the heaviest rain no stream on our farm rose more than six inches.

The cause of this improvement lies in humus. I have not burned vegetation since 1902, though I did in 1923 singe one farm after rain. This leaves a lot of humus for the enrichment of the soil. Humus has restored the soil and enabled me to produce a wide range of crops.

I use everything I can find that will give humus to the soil; all dead vegetable matter

is allowed to go back to the soil. Sawdust is decomposed and put on agricultural land and pastures, so is animal manure and all the waste round haystacks and in feeding stalls.

At the beginning of this year, in addition to ploughing, we hoed all the grass and weeds. Virgin soil, abounding with stones, large stumps and roots, could not be ploughed, and the grass and weeds on soil which had not been touched for three years were hand-hoed just before planting.

Pastures are cut with a mowing machine, some of the cuttings being allowed to return to the soil to form humus and the balance made into hay. In the spring they are scrubbed with our road-makers and harrowed with a heavy scotch-harrow. This scatters the animal droppings, breaks up old grass and opens up the soil.

Our veldt is only singed—never burned—this being done every second season.

Cultivation is done by the usual methods, using horse-drawn or ox-drawn hoes, supplemented by hand hoeing along the line. Mealies (potatoes) are earthed up with the last hoeing when they are about half-grown. After that weeds are allowed to grow, as they help to maintain the humus-content of the soil when they rot. Karroo manure and decomposed sawdust have been used with equally good results.

A hundred acres of our pastures will nowadays maintain more stock than we used to run on 5,000 acres.

Once the physical condition of the soil is good, ploughing is a waste of time, and once the humus is in the soil it is a bar to erosion. On this farm we have had ten inches of rain in 36 hours, but, thanks to humus, not a hatful of soil has been lost. Besides its part in developing plant growth, humus prevents the soil from crumbling to sand and dust in dry periods and enables it to absorb water readily in rainy periods.

We must cultivate a bitter hatred of erosion and do all we can to wipe it out. Humus is one of the most potent means of doing this and would make drains almost unnecessary. Two farms which we purchased in 1921 and 1923 were rotten with over-stocking and erosion. Humus has killed that erosion stone dead. I do not believe the theory that it is easier to prevent erosion on say 5,000 acres than on a small farm. Humus is the key to the problem and surely an acre with lots of humus is better than several which are deficient. Humus reduces working costs and increases yields. No crop is as valuable as the soil, which if neglected will make your crops become more and more expensive. It follows therefore that the man with the small farm has the more imperative need to give every care to his land.

Some Notes on Plant-Insect Partnerships

By Roger W. Smith

MOST gardeners divide insects into two classes, the honey bees and the pests. This view is very narrow. The matter isn't as simple as all that. The more you go into the matter of the plant-insect partnership, the more you will doubt the value of insecticides—chemical sprays.

You have learned why normal associations are damaged and many plant partnerships broken up by the application of raw, chemical material to the soil. Perhaps you will be interested in discovering how intimate the plant-insect partnership is and how completely this important arrangement is disrupted by the use of chemical sprays.

Plants and insects are inseparable. Because the connection between them is usually thought of as having to do

with pollination, you will likely start your investigation from this point.

In this connection you remember that there are certain flowers of the snapdragon type which have developed corollas that demand the weight of a certain type of flying insect, the bumble bee, to cause them to open so that their pollen becomes available.

Later you learn that certain flowers hang their heads, like the little snowdrops. This form has been caused so that only winged insects may gather their pollen. Crawling insects are frustrated.

You find other plants, like the honeysuckles, that have flowers with very narrow corollas. Their nectar can be reached only by insects having a tongue of sufficient length.

There are many, many more. You will perhaps discover an amazing variety of adjustments which have been made by the plants to accommodate the insects. And whilst these changes have been taking place, the insects have themselves been changing their forms to more intimately associate with their plant partners.

To form an idea of the completeness of this plant-insect partnership, you will no doubt remember the well-known example of the yucca moth.

This moth and the yucca plant are natives of the southwestern desert area of the United States. Both have existed there since time immemorial. The yucca moth is doubtless a plant parasite, yet the plant upon which it lives and is closely associated still thrives. The behavior of the yucca moth demonstrates an intimate plant-insect partnership.

When the yucca flowers are blooming, the female yucca moth goes to work during the night gathering pollen from the anthers of many flowers. This material she makes into a sphere several times as large as her own head. Then she searches out a yucca whose pistil is in the receptive stage.

At this flower she makes an incision in the pistil, still balancing the ball of pollen. She inserts her eggs into the incision. Then she scrambles to the top of the stigma where she forces the pollen into it to insure its fertility.

You turn the matter of the yucca moth over in your mind. You ask yourself a few questions. Apparently long before man understood these matters, the yucca moth's instincts had guided the moth in such matters as where to find the pollen, how much, where and when to deposit it to gain its maximum value, and just how to deposit it.

But suppose you look at this plant-insect partnership from quite a different direction. Suppose you think of it in terms of root crops.

In the wild, plants forming large roots have been so long associated with boring and gnawing insects that they have made arrangements to prevent damaging inroads. Many wild roots contain very poisonous and unpleasant substances which are formed to discourage borers. Rhubarb roots are typical. Wild carrot, wild parsnip, and arum lily roots are other examples.

It seems likely that the fine flavor of many of the plants which form our cultivated root crops is caused by a modification of the substances these plants developed as a result of their long association with insects.

You turn to other insects. What of the aphids and the ants which encourage and watch over the aphids? The insects like the circulio which cut off the tips of the long, tender shoots? What of the caterpillars that eat foliage or prevent its proper growth? Shouldn't one immediately seize upon a chemical spray or powder and destroy these destructive pests?

All these insects the plants have long known and with all of them they were well acquainted long before man came onto the scene.

You think over what you have already discovered about the plant-insect partnerships. What is wrong in a case where aphids do great damage? You wonder if the damage is so great because, perhaps, of some abnormal growth of the plant.

If you have appreciated the delicate balance between the plant and the insect's activities, you will discover that the lack of balance is caused not by the insect but by the plant.

Aphids feed upon tender shoots. If these shoots are produced in too great number for the good of the plant, the numbers of the aphids are likely to increase. You wonder whether the aphids have something the same effect as summer pruning.

You approve of proper pruning to promote the general health of the plant. Is it possible that in Nature the aphids, the circulio and the like, do much of this pruning?

If you provide your plants

with suffiicent, natural plant food through the use of mature compost humus, they will be healthy and, if other conditions are right, be without spindly growth. Plant growth which greatly attracts aphids is much encouraged by growing the plants in poor soil and attempting to make up the deficiency by the use of much ordinary water into which has been dissolved large quantities of chemical fertilizer.

From the aphids you are led to observations of the ants. Here you run into a most interesting partnership.

The aphids, many of them, are on the plants because they were arranged there by the ants. The ants collect the sticky substance which the aphids exude. The ants are definitely in favor of the aphids. You look further into the matter.

You find that some plants arrange little crystals of sugar around the outside of their flowers to encourage visits by the ants. These ants defend the plant against crawling insects which would rob its nectar. There are about three thousand species of plants which thus are partners with ants and which produce sugar crystals for their use.

Some of the acacias also foam small amounts of food substances on the tips of their newly formed leaves for the use of the ants.

All these things have been common knowledge for a long, long time. Fruit growers as far apart as China and Italy take advantage of the ant-plant partnership. In many places it is an ancient and well established custom to place ant colonies around the fruit trees.

You find that you can go on almost endlessly discovering new plant-insect partnerships. The plant-insect partnership (often the insect is a parasite) is such an intimate affair that the plant would probably perish in the wild without the aid of the insect partner. What to do about it?

First you sum up simply. The insect partner does damage to the plant only to promote its better and more healthy growth, from the plant's point of view. That is why plants grown with the aid of compost humus are likely to be relatively free from insect damage.

You then realize that chemical fertilizer leads only to the chemical spray and man's feeble attempt to dissolve partnerships which have existed as long as plants and insects have existed.

The tendency of modern plant breeders to concentrate on the production of types of plants immune and resistant to insects by searching out and using wild, ancestral strains is in line with this thought. In producing an insect-resistant strain, the plant breeder produces a plant in which the plant-insect partnership is better balanced.

All of which might lead you to suspect that other plant conditions, the bacterial wilts, and the damage caused by fungoid growths which so promptly disappear when plants are grown under proper conditions, might not also be brought about by a partnership. Could it be that this damage is brought about by the action of microscopic partners interested only in their own survival through the survival of the plant form with which they have so long been associated? Perhaps it is.

You may be interested enough to go on from there.

Sprouting Potatoes Are Dangerous

THE potato has assumed an acknowledged place in the every-day diet of many persons. Few would consider it as capable of causing any direct harm to the human organism. But the potato that has been in the vegetable bin or in a damp cellar long enough to give off green buds and sprouts, is not as innocent as it seems. It is dangerous to eat.

What happens to the potato? Scientists cannot fully agree. But the blame is placed mainly on a poison known as solanin.

This poison, from the chemical family known as gluco-

sides, is present in the ordinary ripe potato, but in amounts too small to provoke poisonous symptoms in humans even when enormous quantities are eaten. As the potato begins to sprout, however, Nature effects changes in the composition of the potato. The amount of solanin increases rapidly and concentrates in the buds and young sprouts. It seems to act as a protective chemical.

In addition, the young sprouts acting as if they were suctions pull some of the solanin already present in the tuber of the mother potato into themselves.

Under certain conditions which are not understood, the harmless amount of solanin found ordinarily in potatoes rises to four or five times that amount. When this occurs the sprouting potato becomes dangerous to eat. Outbreaks of sickness attributed to potato poisoning occurred in Glasgow in 1918, and in Leipzig, Germany in 1919. Various cases have been reported since.

Not only the potato that has begun to sprout but also the one that has become old and is on the road to decay should be viewed dubiously. Here again, scientists are not fully in agreement. Some attribute the poisonous qualities to solanin, others to poison forming bacteria. All in all the over-ripe potato too, is harmful.

The solanin when it is present concentrates in the peel of the potato and can be removed by paring. Much of it in the pulp of the potato can be removed by water. This indicates several precautionary methods to be taken if a sprouting potato is to be eaten. Cut off and discard the sprouts. Peel the potato deeply. Then soak the potato in water before cooking. Potatoes cooked with their jackets on retain all their solanin content.

Potato poisoning results in colic, headache, and abdominal pain. In some severe cases it results in coma. It is a risk which can be protected against easily.

Watch for the over-ripe potato, and for the one that has already begun to sprout.

The U. S. Government has found that if apples are stored near potatoes it prevents the latter from sprouting, due to a harmless gas constantly given off by apples. (Methalene gas). Many farmers, for this reason, store their apples near the potatoes.

Another danger in connection with potatoes is covered in an item in the Hospital Topic magazine:

"A touch of Erin in market potatoes, indicating that the tubers have grown too near the surface of the soil and are affected by sunshine, is due, true enough, to chlorophyl. However, it indicates the possible presence of an alkaloid poison called solanin.

"If such potatoes are eaten, they should be sliced and soaked in cold water an hour or two, the soaking water being discarded before cooking."

Manure Binds the Soil

Although it has long been known that manuring or green-manuring of a soil checks washing or erosion, it has only recently been discovered that the effect of manuring goes much further than simply holding the topsoil in place.

Tests by soil researchers of the United States Department of Agriculture show at least two other ways in which decay of the manure curbs erosion. Decay bacteria supply a mucus that acts as a glue or cement to join many very fine soil particles into larger masses—aggregates—that do not wash away so readily.

A fungus feeding on plant tissue throws out growth called mycelium. This mycelium growth is able to bind together the very fine particles of soil in much the same way that larger roots bind together larger aggregates.

The scientists measured the soil binding work of bacteria and fungi in an experimental way by adding sugar to soils as food for these organisms. Sugar alone did not bind soil, but when organisms fed on the sugar they lived and died and left the soil in better physical condition to resist washing.—*The Farmer's Weekly* (South Africa).

* * *

Hoeing

To save work in hoeing weeds, place a mulch of straw, hay or ground corn cobs, etc., in the aisleways between the rows. This will keep the weeds from growing and will keep the ground moist in periods of dryness and draught.

The Mysterious Fertility of China

By Dr. Ehrenfried Pfeiffer

Formerly Director of the Bio-Chemical Research Laboratory at the Goetheanum Dornach, Switzerland. Now at Kimberton Farms, Kimberton (Pa.)

(Excerpt from the book: "Bio-Dynamic Farming and Gardening" Anthroposophic Press, New York.)

IN Europe we must face the fact that a soil which has not been under cultivation more than a few centuries is no longer capable of nourishing its population completely in every respect. Yet Switzerland has about 225 to the square mile, Germany 343, England 660. Censuses of the heavily populated regions of China and Japan show from 1750 to 2000 inhabitants to the square mile. To be sure, this is the case only in purely agricultural regions.

In the province of Shantung, China, for example, a family of twelve plus a donkey, a cow and two pigs is normal for a farm of two and one half acres. In Central Europe a peasant farm of 40 acres, about sixteen times the size of the Chinese farm just given, can barely support a family. In the thickly settled Asiatic regions 240 people—besides their domestic animals—live on the same amount of ground and on what it produces. Obviously the extraordinarily low requirements of the oriental peasant and agricultural laborer make this possible. Yet from the biological point of view the productivity of a soil which for thousands of years has been able to give complete nourishment to its inhabitants is an amazing phenomenon.

All work in China is manual labor. This conserves the soil and permits an inner aeration and mixing. Mixed cultures of as many as six different kinds of plants in various states of growth utilize the mutual action of plant groups upon one another. To enlarge the surface area, everything is planted in between and upon ridges. Mineral fertilizing is still unknown there — fortunately for the Chinese. Scientists who have visited such regions and studied them from the background of their technical knowledge say that a crop failure in this soil is a rare phenomenon.

Here, then, it has been possible to keep a land in its original state of fertility by the use of the oldest cultural methods of humanity—*humus conservation* and *manual labor*. And yet the unnatural

overpopulation shows that here too, the biological balance is disturbed. A visitor to the great river-valley plains can observe on adjacent hills and mountain chains poorly grassed or steppe-like impoverished land, rapidly approaching the characteristics of a desert. The overpopulated fruitful regions are immediately adjacent to the extreme opposite – unfertile desert lands.

We know that it was lack of food, caused by the overcrowded conditions of their country, which really drove the Chinese to cherish ancient, tested methods of cultivation with religious reverence. The value of the ground to the individual who inherits it can be seen in many a law and regulation. The land is the property of the State, formerly of the Emperor. Whoever *cultivates the land well can call it his own as long as he cultivates it.* If he ceases to do this, then another person, or the State, has the right to take over the field in question.

★★★★

Should he be able to locate the spot where the soil and mud have been deposited, he can settle there. If this misfortune happens in an already settled region, then the earlier owners and owners who follow the earth carried down by the flood have to divide their small piece of land.

When the soil of the field begins to show signs of exhaustion, the whole family cooperates to carry the top soil in baskets and carts into the farmyard. There the earth is carefully mixed with manure and plant refuse and composted. While there, it is turned over many times. Meanwhile the lower soil of the field is reinvigorated by a planting of legumes. After a time the regenerated earth is again returned to the field and the cycle of thousands of years begins again.

If we can speak in the Occident of "natural" catastrophes which threaten the regions of human habitation, we must in a similar way point to the Orient where other human catastrophes of the most tremendous magnitude are in the process of preparation. The over-populated land in China has already reached the extreme limit of its productive capacity for meeting even the minimum existence standards of the people living on it. Next to this land lie the poor hilly regions, stripped bare of their trees. The process of deforestation in China had already begun on great stretches of land as early as 100 B. C., and was practically completed by 1388 A. D. The only exceptions have been some southerly and southwesterly regions which in part have a climate approaching the sub-tropical. The general conditions of the water supply of a country are to a large extent disturbed as soon as the balancing effect of wooded areas is lacking, and without these wooded areas, the extremes of climate draw still further apart. Sudden torrents of rain and floods alternate violently with periods of drought, heat and extreme cold. The balancing, water-retaining, cooling and warming regulation provided by the woods is lacking. The following is quoted from the exceptionally fine description by Professor G. Wegener in an article on China.

"On the slopes of the hills we see either a dusty, poor stand of plants of secondary quality, or the complete and fearful bareness and emptiness of stony ground. The higher portions are quite badly furrowed and torn by the rain, while the lower are always newly covered with streams of mud which destroy the fruitful soil at the foot of the hills. The levels and valley bottoms are cultivated as gardens right to their extreme edges. The great lack of fuel drives the inhabitants to a ruthless interference with the natural reforestation, even on the uncultivated lands. Richtofen recounts with a sort of rage how in North China there is widespread use of a kind of claw-like utensil by means of which even the most

modest little plant root is torn out of the soil. In some sections of the country grass roots, dung, etc. already today have to serve as the only fuel. In South China, although this was settled much later by the Chinese and is still today much more thinly populated, the exhaustion of the woods is also already very far advanced and goes forward at a gigantic pace; and here, too, with all its devastating results. This is especially true in the area of thickly populated sections, as well as in the region on the Sikiang. The Chinese culture, which in its conservatism is still today very strongly a culture of wood, needs this wood in large amounts—and so the consumption of the forests goes ceaselessly on. It thus becomes clear that even for the inexplicably cheerful Chinese peasant the minimum standards of existence are being rapidly left behind, and that precisely from these provinces comes the main stream of the tremendous Chinese emigraiton which Manchuria has in recent years absorbed. The denuded hills and mountainous regions, about 50 per cent of the total area, remain practically unutilized.

"From here, as well as from the similarly over-settled regions of China, (says Professor Wegener), there comes forth a type of man who, because of his low standards of living and the toughness of his body and nerves for the performance of his traditional labor, eliminates every competitor from the field both at home and in the lands in which he settles. Herein lies perhaps the greatest 'Yellow Peril,' when the spreading of the Chinese over the earth becomes more extensive than today!" And the lack of wood in China brings another problem with it, the impossibility of getting fuel for cooking and for warmth.

One need have no prophetic gifts to realize that in those regions a human catastrophe is in preparation. This will have an active effect on the inhabitants of Europe as well. Dr. Steiner once suggested that the student of human affairs would do well to investigate the influence of food as the driving, unrest-producing motive power behind the migrations of peoples. Races which had remained for long periods of time on the same soil have felt themselves "becoming restless" in the development of their common life, because of their one-sided nourishment, and have sought for a balance.

What, in short, is the situation of Europe which occupies a center place between the two extremes of the East and West? In Europe there is a temperate climate, and a healthy division between woods and fields, lakes and plains, hills and moorlands. There was still in the last century a peasantry firmly based on the soil, one which tilled the earth out of a traditional wisdom. But engineering methods and science, together with economic difficulties, have already taken hold of the situation, so that the originally healthy structure of the soil is beginning to fail. The place of the peasant is being largely taken by the traditionless agriculturist, or "Tiller-mechanic" who appears no longer to have any relationship to the problem of the soil which is being attacked by a world-wide sickness.

Whoever is candid and honest with regard to the facts of modern agriculture realizes that this situation exists, although he may not like to face it. The peasant knows it by his feelings. It is known by the research scientist on whose desk reports pile up concerning the unsolved problems of soil fertility, the fighting of insect pests, etc. A leading agriculturist said recently: *We have been exerting ourselves for the last two decades to halt this process but our efforts have been fruitless. What is the solution? Where is the answer to be found? The disease caused by lowering the natural soil fertility is a world sickness.*

With Sir Albert Howard

Jan. 22, 1943.

Sir Albert Howard:

On our farm we practice a five-year rotation with corn the first crop, then oats, wheat or barley and then two years clover or alfalfa. We use all our compost on the corn crop only, figuring on the residual value being sufficient to cover the other crops in the rotation, with the exception of green-manuring practices. What is your opinion?

Sincerely,
J. I. Rodale.

3rd March, 1943.

Dear Mr. Rodale,

In reply to your letter of January 22nd, I think if you add your compost to the ley (clover) before it is ploughed in for the corn crop, the humus so produced would not only give you a bumper corn crop, but would leave the soil in good condition for the next three crops, such as oats, wheat and barley. I am a great believer in sheet-composting the residue of the ley—that is, grass and clover, which you refer to in your letter as hay.

With best wishes,
Yours sincerely,
A. Howard.

30th March, 1943.

Dear Mr. Rodale,

If you have come across a book called *Corn Bread and Creek Water* by Charles Marrow Wilson, you might find something in it of interest, because it deals with an ancient bit of agriculture which seems to have a considerable bearing on present-day practice. If you think the book would interest me, you might send me a copy through the post, because it is practically impossible to get one in this country. The only copy I have heard of in the British Empire is in the Public Library in Johannesburg, South Africa.

Yours sincerely,
A. Howard.

January 19, 1943.

Sir Albert Howard
Milnthorpe, Westmoreland,
England.

Dear Sir Albert:

I am in receipt of your letter of December 16th and the enclosure. I also want to acknowledge on the previous day your letter with enclosures and we especially enjoyed reading the one about mechanical means for turning heaps, as this is the pressing problem of the moment. Your articles in our magazine are creating extremely favorable comment.

I would like to submit some questions to you:

1. Some farmers here have been taking manure and putting it in a silo and allowing it to ferment in there. As they take material out from the bottom, the contents of the silo keeps pushing downwards. It is a continuous process taking and keeping the new manure in through the top. What would be your advice regarding such a method?

2. In this country sometimes the sun is very strong and seems to dry out the compost heap, necessitating a great deal of watering, which is a laborious job. Would it be practical after the top layer of earth is put on the compost heap, to pile straw as a mulch on the top and sides of the heap to conserve the moisture and to prevent excessive heat by the sun.

3. There is much material that goes to waste in chicken poultry shops. What would you think of getting some of these chicken entrails, feathers, chicken heads and feet, which are usually sent to the town incinerator for burning, and use it on the land. What would be the best way to handle that?

Your reply to these questions will be greatly appreciated. With very best wishes.

Sincerely yours,
RODALE PRESS,
J. I. Rodale.

Heversham,
Milnthorpe,
Westmorland.
2nd March, 1943.

I will now endeavor to answer your questions.

1. The method of keeping manure in a silo and allowing it to ferment is very similar to the old method of the covered yard, which used to be in vogue in this country fifty years ago. This consisted of adding fresh bedding in the yards until a deep layer about 6 ft. was obtained; this was then cut out with a hay-knife and carried out to the land. The disadvantages of the method are that nowadays there is insuffi-

cient labor to do the removal; further there is a great waste of animal residues, because in the compost heap the present supply of animal residues can convert much more organic matter into humus than is the case at present.

In this connection you will be very glad to hear that one of my correspondents considers he has solved the problem of the mechanization of the manure heap and has secured the services of the best implement makers in England to make the machine, which can be driven by a tractor and used on every farm of 200 acres or over. As soon as ever the trials are completed, I will let you have full details so that you can bring the matter before your readers. It is quite likely that this whole mechanization problem will be solved during the present year.

2. Where the fermenting heap is dried out by the sun, it is a great advantage in compost in pits. This is described on pp. 45-48 of *An Agricultural Testament.*

3. I think the chicken waste from the poultry shops should certainly be used. One good way of using it is to compost it direct in the soil in trenches. If a trench is made about a foot deep and a foot wide, a layer of vegetable waste can be laid at the bottom of the trench followed by a layer of chicken waste material, then another layer of vegetable residue, followed by sufficient soil to more than fill the trench, so that as composting takes place the original level of the soil will more or less be obtained. This method is being used in the case of the bodies of dogs and cats from places where these animals are killed, and it works very well. Over the trenches crops can be grown in the ordinary way. In this way it is possible to get a small area of garden into a very high state of fertility without any nuisance of any kind.

Yours sincerely,
A. Howard.

Reader's Correspondence

Editor of Organic Gardening.
Dear Sir:

You say in the March issue of Organic Gardening that it is a hunch with you that soil sterilizing is a wrong practice. Well, it is just a hunch with me that your hunch is right. Here are my reasons. Last fall after much trouble and no end of efforts I secured some fresh seed of Trailing Arbutus, in fact I got the berries in the vine. I had read and re-read all the literature that I could lay my hands on, on the Propagation of Trailing Arbutus; and so to improve on Aiken. Bailey, Coville and Florence Barrows I thought I would sterilize the soil. I baked it. With meticulous care I put in my precious seeds and sat to wait for results. The seeds germinated fairly promptly and very evenly. I was the happiest and proudest man in this world. But the seedlings did not seem to grow, turned pale then yellow and then disappeared. I began to suspect something. Maybe baking was too much: I would do it some other way.

The time came early in March to plant my Tomato seeds, and to improve in my own improvements I sterilized my soil by steaming it in a sort of Bain Marie. That could not fail. The seeds germinated in due time and very soon I had a good stand of seedlings, but all of a sudden the seedlings stopped growing, began to shrink, to turn yellow and to die fast. When I had fewer than the required minimum I sank the flats with the seedlings in a solution made of water and compost, the formula for which I had found in some number of Organic Gardening. The response was almost instantaneous: the mortality was arrested though not entirely stopped, the seedlings revived and started to grow, I kept on nursing them with what I call compost broth made by mixing very finely ground and sifted compost with water and stirring till it is almost a liquid jelly. The seedlings are not very large but they are stout with wooly stems the thickness of a pencil.

The proof may not be conclusive but it is all the proof I want. I will not sterilize the soil any more.

Manuel Calvo,
Kensington, Md.

Mr. J. I. Rodale
Emmaus, Pa.
Dear Mr. Rodale:

Please tell me if in the Indore composting we get a full quota of phosphorus, and how, from what. I see whereby in the use of the ordinary materials both nitrogen and potash are obtained. But as to phosphorous, I am puzzled. And an answer would be much appreciated. . . . One other thing in this connection.

I was left most unconvinced and dissatisfied by the story in your March issue condemning commercial inorganics as a source of disease. It seems to me the author missed the point, for I consider it highly questionable if poison is communicated to the consumer in this way, though there is another practice in truck farming which is so obviously dangerous to the public as to constitute a national disgrace. I refer to the unrestrained use of arsenate of lead and other poisons in spraying and dusting.

Back in 1932 one of the reforms most dear to the heart of Rex Tugwell, the father of New Deal policies, was the regeneration of the Pure Food law, in particular the lowering of the allowable strength of arsenate of lead used by farmers. But the Farm Bloc raised such a rumpus that in the end the percentages, instead of being lowered, were raised! Go to the bat on that and you have something.

Yours very truly,
Louis Livingston,
Osprey, Florida.

Answer

Dear Mr. Livingston:

The Indore Howard method of composting gives a satisfactory quota of phosphorous. Such compost is made from a combination of animal and plant materials which is of sufficient variety to give all of the elements necessary. In Sir Albert Howard's book "An Agricultural Testament," page 70, he says that compost made from sugar cane stalks yielded 280 lbs. of nitrogen and 160 lbs. of phosphoric acid per 40 tons of compost. On page 111 he gives nitrogen 0.8 per cent. phosphoric acid 0.5 per cent, potash 0.3 per cent of humus.

Nature is fertilizing the soil constantly by natural means, and there are certain phases of the principles of fertilization that not even the scientists know anything about. Sir Albert Howard on page 3 of the above mentioned book says, "Even in soils markedly deficient in phosphorous, trees have no difficulty in obtaining ample supplies of this element." Compost, made properly, contains everything needed by the soil, that man can furnish, for healthy growth. In China, compost exclusively has been used for 40 centuries and the soil gives amazing yields of crops.

Regarding the article in the March issue of the affect that the use of commercial fertilizers cause human disease, the author, Dr. Gerrish, discussed only one phase of the question, but sufficient evidence is at hand that we would be a much healthier race if we used humus to the exclusion of the so-called chemical fertilizers. Poison sprays are also a serious factor in keeping the public health below par, but this practice has been condemned in hundreds of health, medical and general magazines and is well-known to the public. The public reads about it but is severely apathetic in its non-interest.

The chemical fertilizer angle, however, is something of a new theory, and must be thoroughly investigated and tested by the medical profession in controlled experiments.

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Organic Gardening
Emmaus, Pa.
Dear Sirs:

You have shown through the pages of Organic Gardening, that vegetables, fruits, etc., grown on naturally fertilized soil are far superior in taste and quality than those produced on chemically treated soils.

I was very much interested to note in a recent issue of O. G., how you compared the way a resistance to disease is built up in plant life much the same way it is in our own lives. This certainly fits in with my pattern of thought. Perhaps you have also noticed that plant disease and pests prevail at the same time. It would seem by this that these insect pests were produced by nature for the specific purpose to help fight the ravages of plant disease. Although this condition is undesirable, it might be much worse if pests of this nature were not present to devour the affected parts of plants.

I would like also to say a few words in support of the use of compost. Judging from reports, many farmers object to it's use because of the labor involved in preparing the heap. It has been pointed out how weed seeds are destroyed in a

properly handled heap. Yet farmers will, year after year, toil and sweat in the hot weather, little considering the labor expended in an endeavor to rid the soil of weeds which could be avoided if compost were used over a reasonable period. Comparing the amount of labor and time expended in preparing the heap with the amount involved in weeding and hoeing crops, I think the latter greatly exceeds the former, not to mention the advantage in yield and quality of crops when using compost and the subsequent profitable returns to the farmer. If farmers can be shown these advantages, I think they would be more inclined to favor it's use.

Yours faithfully,
Wilfred H. Hadgson,
Saint John, N. B., Canada.

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Chilao CPS camp
La Canada, Calif.
April 2, 1943.

Organic Gardening
Emmaus, Penna.

Dear friends,

I have some questions for you.

1. Is "night-soil" used in the Indore process, and what are the dangers of using it?

2. If the farm-house has plumbing is what comes out of a septic tank of any value in composting?

3. In building a compost heap using wastes from cooking and so on may the pile be built up from day to day over a long time, or is it to be built up quickly in a short time?

Sincerely,
Phil Meighan, Jr.,
La Canada, Calif.

Dear Sir:

1. Regarding your questions, we have been against the use of night soil (human excrement) although Sir Albert Howard recommends it. Recently, tests made in South Africa seem to show that by composting night soil properly, all of the dangerous germs are killed off.

2. In such a septic tank that you mention, which does not contain added chemicals, there is still the same question of the use of night soil.

3. You can put material into compost heaps every few days if you care to, but each time it should be covered with earth. This is not the best method. It is probably best in this case to have separate small heaps and then after about a week or so, to place it in your main heap. In the temporary heaps, of course, you would have to cover the material with earth.

Dear folks:

I am interested in compost and I am 62 and now no help in the nursery (green house); my compost pile is an old sheep-dip which does not leak, so all the good is retained. An old piece of roofing divides it in the middle and in one half go leaves alone, and this is good in less than a year; the other end contains all the vegetable waste from the kitchen, as well as a few leaves; this is heavy to lift and I am unable to turn it over; always one of the workmen did it, and he threw it out in a kind of bin, (an old boarded up bed) and then in a few weeks it could be used. Last year when I sent a boy to bring some it was full of dark grubs I thought, different from any I ever saw, and NOW after I think of it more I believe they resembled large cutworms more than anything; have you had any experience with anything like that? Would arsenate of lead sprinkled over this finished compost this Spring take care of the animal life without hurting plants?

Sincerely,
Ida M. Miller,
Jackson, Mich.

Dear Mrs. Miller:

We were very glad that you wrote us under date of April 5th about your method of making compost.

The trouble probably in your case is that the compost is not mixed properly and is not turned often. In that case, various things may happen. Sometimes a compost heap contains fly larvae, which look like small worms. If you will follow the instructions contained in the little booklet we are sending you, I am sure you will not have any trouble.

Under no circumstances would we recommend the use of arsenate of lead, as this is a strong poison which would remain in the compost. It does not decay.

●

Organic Gardening
Emmaus, Penna.

Gentlemen:

Have received and noted the March issue of your publication with much interest.

However, I am in somewhat of a quandary as to how to make application of the Indore

method of composting for the following reasons:

1. Since I have no one at home during the day to care for live stock, do not have any —and animal manures are simply not marketed in this section.

2. Our nearest city disposes of its garbage by burning in an incinerator plant; and also operate a sewage disposal plant but am informed the residue, because of chemical content is unfit for use in composting.

3. Not having the much needed nitrogenous matter required in the process of decomposition, I have, upon recommendation of State Agricultural Dept. authorities, and such authors as, Thompson, in his book on "Vegetable Crops" and Weir, in his book entitled "Soil Science," been using chemical nitrogen activators in breaking down the vegetable matter, with reasonable success.

I am somewhat intrigued and fascinated with the thought of expanding my knowledge of composting practices, and if you have any further suggestions of what organic carriers of nitrogen, which might be readily obtained that would replace the benefits derived from or need of using any form of chemically derived nitrogen in my composting experiments I certainly would appreciate hearing from you.

Yours very truly,
John W. Rothenhoefer,
Frederick, Md.

Dear Sir:

Replying to your letter of April 7th, we do not recommend any chemical nitrogen activators for the compost heap. If you will follow the instructions contained in our little sheet we give with the subscription, a copy of which we are enclosing herewith, you will get a very good compost.

If you do not have manure or animal matter, you can make the heap without it for a few years, but eventually there would be trouble if you did not include some manure or other animal material such as fish and chicken cuttings from the stores, etc. You might buy a little bone meal, dried blood, tankage or other 100% organic materials, and put it in the heap with your green matter, as this would be a substitute for animal matter.

●

Organic Gardening:

Our soil here on the Pacific Coast is washed out every winter, consequently if we use grass clippings and other vegetable matter for a compost heap, how can you get minerals into it, if they are not in the soil to begin with? (I mean the soil on which the straw, hay, grass, etc., grows).

2. You speak of chemical fertilizers, does that also include mineral fertilizers?

Last year I used "Vigoro" which, I understand is a mineral fertilizer consisting of all the minerals of which the human body is built, or most of them. Surely, that can not be harmful?

Will you kindly explain this? I raised some very fine and big carrots on nothing but rotten straw (might have had some animal excretions in it) also potatoes, beets, etc. All as good and better than on regular ground.

Hugo Mayerhoefer,
Salem, Oregon.

Dear Sir:

Regarding your first question, it is best to use some manure or meat matter along with the grass clippings and vegetable matter in making compost.

The group of artificial fertilizers includes the one called "Vigoro."

We note what you say about raising raw carrots in rotten straw. The only thing that we want to be careful about is that food is grown in the way nature intended it to be grown in the soil and there is a question when it is grown in straw, whether it would contain sufficient minerals and vitamins. You cannot go by size alone. This is very deceptive. The taste is a good yardstick to measure quality by.

●

Organic Gardening
Emmaus, Pa.
Dear Sir:

I chopped up the corn stalks for making compost and they are pretty well broken down in three months and some of the same not chopped are still long and mean to handle, also this summer I expect to use them green after we have taken the roasting ears and I think that they will break up very fast that way.

Chicken droppings don't seem to tear the fibers down like horse manure but maybe the compost will be as good or better, and the chicken is all

that we have except once in a while I can get some of the other from a neighbor.

Very truly yours,
Troy A. L. Brown,
Salem, Ill.

●

Organic Gardening
Emmaus, Pa.
Dear Sirs:

I would like your advice regarding three things.

1. Do you advise the use of charcoal in the compost heap?
2. Is grain-o treatment compatible with organic farming, and do you approve of it?
3. Is "Bacto" compatible with organic gardening—in other words is it organic itself?

Another question—is it all right to ge started plants from sources that use sprays in the early type of these started plants—or is the spraying too harmful to be overcome.

Mrs. Mary K. Gordon,
Maryville, Tenn.

Dear Mrs. Gordon:

We have looked over some of the literature that you have sent and do not feel that any of these materials are necessary where you follow the organic method of farming. We know that the advertisers talk glowingly of their products but results in most cases do not bear out their claims. Charcoal is not necessary in the compost heap. All of the so-called materials and bacteria used to treat seeds are not necessary. Even government experiments recently have shown that these treatments are not beneficial.

The beauty of the organic method of farming is that after a while your soil is so rich that things grow beautifully and grow best if left alone without the artificial helps of our modern civilization. You need not worry about spraying or seed treatments, hormones, bacteria or other such devices.

It is too bad that when you purchase "started plants" that they are plants which have been grown possibly with chemical fertilizers. The ideal condition is to grow your own plants right from seed.

●

Organic Gardening
Emmaus, Pa.
Gentlemen:

I am a recent subscriber of your magazine Organic Gardening. I am deeply interested in the compost method of obtaining fertilizer and humus for the garden.

However, after reading the various articles on same I have failed to find any information as to just how r a t s would be prevented from feeding from such a compost bed in which kitchen waste would be used.

If something can be used to prevent the rats from digging into the compost, I would immediately start using t h i s method, but if there is a possibility of it being a food source for r a t s I could not afford to have anything like that around.

Very truly yours,
Mrs. J. M. Holstner,
Louisville, Ky.

Dear Madam:

Replying to your letter of March 30th, in our two years experience in making compost heaps, we have never been troubled by rats. If your heap is made properly with the use of lime and covered with earth, I am sure there will be no trouble from rats. When lime is placed on the kitchen waste traps, it would seem that rats are discouraged.

●

Dear Mr. Rodale:

One problem I have to find an answer to is—The small quantity of household garbage plus urine even if accumulated for a week isn't sufficient to prevent freezing during t h e cold weather.

How harmful is the freezing and how could it or should it be prevented?

E. A. Bronson
Evanston, Ill.

Dear Mr. Bronson:

The handling of compost during the winter time is a problem and the best thing to do is to construct a cement pit which can be covered with a wooden top and use it to store your garbage during the winter. In the freezing weather, it is impossible to get earth for use in the heap unless you store some of this earth indoors.

Another method would be to make the compost in the winter time indoors, as it is needed, on a small scale. One m a n has worked out a method of making compost in his cellar in a barrel next to the furnace in the winter time.

●

Organic Gardening,
Emmaus, Penna.
Gentlemen:

Does it harm t h e garden

compost if the majority of our garbage can contains grapefruit skins?

Have read somewhere about stone dust fertilizers. What is it?

Respectfully,
O. Ruckseer
West Haven, Conn.

Dear Sir:

In reply to your card, we do not believe that it will hurt your compost if the majority of the garbage can contains grapefruit skins just as long as you follow the instructions for making the heap, using your grapefruit skins as green material, and include manure, lime and earth in the heap. If you have no manure use meat or fish cuttings from the table wastes, or such purchased items as bone-meal, tankage, dried blood, etc. Also see that the heap is sprinkled well from time to time.

Stone dust fertilizers are satisfactory. Be sure that it isn't super phosphate.

●

Organic Gardening

Dear Sir:

Have just used up the compost pile that I made beginning Oct. last.

To my way of thinking and guided by your articles, I considered it quite good although some of the solid stable manure was not entirely broken down although it was rotted.

Needless to say I am going to have a pile the year around, weather permitting, but I ran across an article that speaks of a way to reduce vegetation chemically with the use of acid phosphate and ammonium sulphate.

The point I desire you to advise me on is this. Knowing that the application of chemicals to the ground is injurious, is the use of chemicals, other than lime, in preparation of humus, since it decomposes entirely, (or does it?) also injurious.

Yours truly,
E. W. Kessler,
Villa Park, Ill.

Dear Sir:

I am glad that you are having success with your compost. You will find that occasionally there will be some lumpy material left. This may be used and will disintegrate in the earth. It is an indication that something was wrong in the heap, possibly not enough sprinkling, or thorough turning or maintenance of air holes. For a very fine flower garden, compost might have to be ground up fine. We do not recommend the chemicals that you mention or any other chemicals in the compost heap except lime. Ammonium sulphate, which you mention, is one of the worst offenders in the chemical fertilizer field. It is actually recommended by the government to kill earthworms on golf courses. Strong chemicals in the compost heap will still remain in the finished compost to a certain extent.

●

Organic Gardening

Dear Sir:

I have quantities of *live* oak leaves—they are hard to decompose rapidly—your advice is asked. These are not soft

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ORGANIC GARDENING
Emmaus, Pa.

Gentlemen:

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NAME .....

.....

ADDRESS .....

.....

like the eastern oaks—more like holly leaves.

Mrs. A. Dolenz,
San Francisco, Calif.

Dear Mrs. Dolenz:

Thank you very much for your subscription to Organic Gardening. Oak leaves are stubborn to break down. If you will follow the instructions for making compost heaps, as contained in the special leaflet that we sent you with your subscription, you will find less trouble than if you merely tried to break the leaves down themselves. The oak leaves preferably should be mixed with other green materials such as grass clippings, weeds, table waste, etc. It is also advisable to let oak leaves weather in a separate pile for a few months before putting them in the compost heap.

●

Organic Gardening
Emmaus, Pa.

Gentlemen:

With further reference to your letter of April 9, 1943 and the Indore method of composting:

The instructions given are of a general nature and allow for flexibility hence I would like to have your comments as to formula or quantities of the following materials you would recommend be added to vegetable matter to be composted, such as pea and bean vines, cabbage leaves, tomato vines, sweet corn stover, weeds, sweet potato vines, etc. (per net ton of such matter).

Finely pulverized lime stone, or ground burnt lime or hydrated lime.

Raw bone meal having an analysis of 3.7 per cent nitrogen and 20.5 per cent P205 or tankage 5-10 per cent nitrogen —15 per cent P205.

Awaiting your comments with interest, I remain

Yours sincerely,
John W. Rothenhoefer,
Frederick, Md.

Replying to your letter of April 14th, it is not necessary to measure or weigh material in the compost heap. That is the beauty of the Indore Process. The material that you mentioned such as pea and bean vines, cabbage leaves, tomato vines, etc., are what we call green matter and you must follow the instructions for green matter as given in the instruction sheet which we sent you. Use about 6 or 8 inches of such green material then about 3 or 4 inches of manure sprinkled with lime and then a thin layer of earth. Quick lime is the best. Next comes hydrated lime, and pulverized lime stone is third. If possible. try and secure quick lime.

Regarding raw bone meal and tankage, it is best to compost them before using as fertilizer. In a pinch, of course, they can be used as fertilizer direct, but you will get much better results if you compost them in the heap, putting them in in place of animal manure. On account of their high price, it would be best to put in less of this material proportionately in the heap than animal manure. The various proportions of material as advocated by Sir Albert Howard in the Indore Process are flexible and some times may be changed to suit the conditions. Compost may be made with half the amount of animal manure if necessary.

(Continued from inside front cover)

forts have been made to bring into use much of the organic waste matter which was formerly neglected and destroyed. At Batu Cajah, and at Pontian in Johore also, there have been notable achievements in this direction.

In rural Singapore, experiments on composting have been in progress for several years. Investigations were begun in Pasir Panjang District more than five years ago, but we were then too much inclined to pay attention to the type of soil analysis which perpetuates the faulty doctrine that plants require nitrogen and potash and very little else. It was not sufficiently realized that plants, like all other living organisms, require delicate adjustment of their environment to thrive. We now have ample proof that this adjustment takes place through the agency of soil fungi and bacteria. These vital agencies are supplied in compost. Soil vitality and fertility cannot be long maintained in any other way.

This new knowledge came to be of value in our local war effort, because by September, 1939, our plans were mature. The rural incinerators which were designed to consume and destroy the household refuse of 200,000 villagers were put out of use. In their place composting schemes were set in operations in all rural centers. Thanks to the energetic cooperation of the Agricultural Department and of the Rural Board, considerable areas of land were set apart for growing vegetables. Of these the most noteworthy was the Changi squatter cultivation scheme. This new vegetable garden area, worked by Chinese, was nearly 200 acres in extent; it relied greatly for its produce and fertility on the large rural composting installation at the 10th mile, Changi Road. Due to accumulation of reserves, the Rural Health Department was also able to deliver 115 tons of compost for use by the Veterinary Officer in creating a 10-acre meadow of grazing grass for cattle.

However, the bulk of rural village compost has been at the root of a scheme for fostering home cultivation among the laborers employed by the Rural Health and Public Works Departments. These men, about 500 strong, each have plots not less than 20 ft. square. The estimated value of their vegetable produce was at least 20 cents a week per head. In the past two years these workers alone grew and ate fresh vegetables to the value of about $1,400. No doubt, these men have benefited in health as a result.

The improvement in the quantity and quality of the vegetables grown has been amazing. There is evidence of this in successive vegetable shows which have been held to stimulate and sustain interest.

Side by side with these achievements the Education and Police Departments and other agencies have been active in stimulating vegetable cultivation and composting schemes in school gardens, barrack compounds and elsewhere, with the idea that home-grown produce is the best.

But the realization of the ideal of fresh vegetables for all is still a long way off. There is much to be done before the great mass of the population obtain the quality and quantity of vegetables and fruit sufficient to make our people healthy and resistant to disease. The reason is not lack of land, nor is it lack of spare-time labor, because gardening can be nearly everybody's hobby. What is needed more than anything is an ever-increasing supply of compost.

It is from cities, however, that the vast bulk of compostable materials is collected. Is it right that these valuable elements should continue to be destroyed and wasted?

War intensifies the need for salvage. Compost-making is a most effective form of salvage. Better and bigger crops are just as important as increased armaments. In compost we shall, indeed, have something of even greater value, because by its making we shall save ourselves and serve posterity as well. We know, on the authority of Sir Albert Howard, that healthy crops can impart health to the animals that eat such food. He explains how susceptibility occurs when fodder is grown on poor impoverished soil. If compost-grown fodder is supplied to animals they will resist infection. Is it not reasonable to infer that mankind will benefit likewise, when vegetables in the daily diet are grown upon good compost-impregnated soil?

My own belief is that common acceptance of these proposals on compost-making will hasten our victory and will be the means by which health and prosperity can return to this hard-pressed world of ours.

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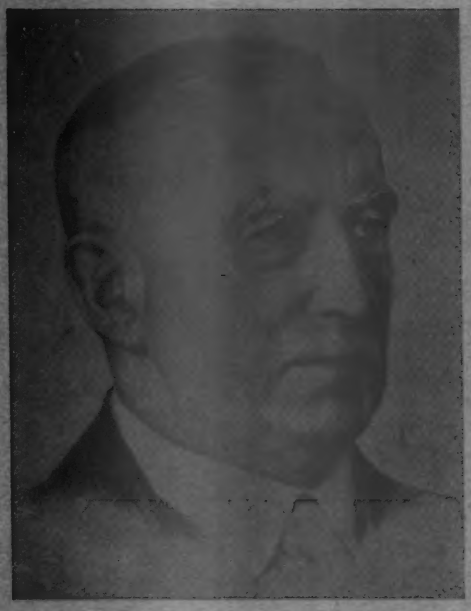
By Sir Albert Howard, C. I. E., M. A.

Formerly Director Institute of Plant Industry Indore, and Agricultural Adviser to Central India and Rajputana.



Sir Albert Howard C. I. E., M. A.

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Organic Gardening

Emmaus, Penna.